

## I. IDENTIFICATION DATA

<b>Title:</b>	<b>Waste CO<sub>2</sub> as a raw material to produce methanol</b>
<b>Author:</b>	<b>Farid Ismayilov</b>
<b>Type of thesis:</b>	Master
<b>Faculty/department:</b>	Faculty of Mechanical Engineering
<b>Department:</b>	Department of Process Engineering
<b>Supervisor:</b>	assoc. prof. Ing. Lukáš Krátký, Ph.D.
<b>Supervisor's place of employment:</b>	FME CTU in Prague, Department of Process Engineering

## II. EVALUATION CRITERIONS

<b>Diploma thesis assignment</b>	<b>Average</b>
<i>Difficulty evaluation of the diploma thesis assignment.</i>	
The main aim of the thesis was to prepare a rough techno-economic study of waste CO <sub>2</sub> to methanol technology, i.e. to design PFD chart, to perform an economic study of investment and productions costs, and payback. This topic was, therefore, a typical job for mechanical engineering, so its difficulty was average.	

<b>Fulfilment of thesis's assignment</b>	<b>Fulfilled with great reservations</b>
<i>Evaluate, whether the proposed final work fulfils the assignment. Comment where appropriate, points of reference that were not fully met, or if the work is extended compared to the assignment. If the assignment is also not completely fulfilled, try to assess the importance, impact and possibly cause various deficiencies.</i>	
The main tasks of this thesis were (i) to prepare an overview of current knowledge about waste CO <sub>2</sub> to methanol technology, and (ii) to perform a rough techno-economic study, i.e. design PFD scheme, do mass and energy balances and prepare an economic analysis of the technology. The review is very poor and no final statements and knowledge gaps are missing as demanded by the supervisor. As for the practical part, PFD design is directly taken from one referenced paper, mass balance as well that just verified. The own work of the student is verification of mass balance, the energy balance of technology and economic analysis. The tasks of the thesis were fulfilled with great reservations.	

<b>Activity and independence during thesis's processing</b>	<b>E – sufficient</b>
<i>Evaluate whether the student was active during thesis's processing, whether he respected specific deadlines, if his solution was continuously consulted and whether he was sufficiently prepared for consultations. Consider the student's ability to work independently and creatively.</i>	
The author's approach was enormously active. Nevertheless, a very strong support of supervisor was needed during consultations for practical than normally expected and needed, one problematics was consulted several times, and demanded review and tasks from practical part were fulfilled superficially.	

<b>Professional level</b>	<b>E – sufficient</b>
<i>Assess the expertise level of the thesis, using knowledge gained from the study of scientific literature, documentation and utilization of data obtained from practice.</i>	
The professional level of the text itself and all the performed process calculations have a sufficient level. Plenty of formulations are not clear, not explained. He was able to find perfect literature sources but there was a big problem with their interpretation to define current state of art and to prepare practical part. PFD is therefore overtaken from a paper, mass balance is just verified. Nevertheless, based on such an information, he was able to correctly perform energy balancing and economic evaluation of the technology.	

<b>Formal and language level</b>	<b>C – good</b>
<i>Assess formal correctness in the bibliography, the typographical and linguistic aspects of the thesis.</i>	
The thesis contains all the necessary formal requirements. Nevertheless, different size of letters and formatting is used in the text. Printed PFD scheme and some pictures in the text are not well readable as pointed out several times during consultations.	

### **Bibliography**

### **E–sufficient**

*Comment the student's activity during the acquisition and use of learning materials to solve thesis. Characterize the selection of sources. Assess whether the student made use of all relevant sources. Verify that adopted information is properly distinguished from student's results and considerations, whether citation forms correspond with ethics, whether bibliographic citations are complete and finally whether all citation is in accordance with the practices and standards.*

The author used 35 references in the text. Citations in the manuscript and their format listed in the bibliography are partially in accordance with the European Copyright Act No. 121/2000 and even with all the citation practices. It is clear which information is referenced and which information is his own contribution and novelty. Nevertheless, there is still the mistake of text referencing in the thesis, i.e. direct copy and paste of the text from referenced papers.

### **Other comments**

*Comment the level achieved major results of the final work, e.g. the level of theoretical results, or the functional level of technical solutions, publication outlets, experimental skills, etc.*

No comments

### **III. FINAL EVALUATION AND PROPOSAL OF CLASSIFICATION**

*Summarize aspects of the thesis that most influenced your final evaluation.*

Master thesis of Mr Ismayilov was pioneering. There is no techno-economic evaluation of waste CO<sub>2</sub> to methanol technology. So based on the deep review, there was the aim to prepare a rough techno-economic study of waste CO<sub>2</sub> to methanol technology, i.e. to design PFD chart, to perform an economic study of investment and productions costs, and payback. This topic was, therefore, a typical job for mechanical engineering, so its difficulty was average.

The author's approach was enormously active. Nevertheless, a very strong support of supervisor was needed during consultations for practical than normally expected and needed, one problematics was consulted several times, and a review and tasks demanded by practical part were fulfilled superficially. As for the practical part, PFD design is directly taken from one referenced paper, mass balance as well. It is just verified. The own work of the student is verification of mass balance, the energy balance of technology and economic analysis. There are also some problems with bibliography, text understanding, formatting. There is still the mistake of text referencing in the thesis, i.e. direct copy and paste of the text from referenced papers.

Based on the information above, the topic seems to be very hard for him because multidiscipline knowledge of process engineering skills was demanded. He was very skilful in technology balancing and its economic evaluation. He started to prepare thesis several weeks before submission deadline that reflects its quality. Nevertheless based on consultations and thesis quality, I have to state that Mr Ismayilov was proved by such a thesis that he has fundamental skills of a mechanical engineer.

Based on its quality and student's level during the preparation of the thesis, I undersigned Lukas Kratky, I evaluate it as the supervisor by the grade

**E – sufficient.**

Date: 20.8.2018

Signature: assoc. prof. Ing. Lukáš Krátký, Ph.D.