REVIEWER'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Dynamic Modeling of Kilning Process in Matlab & Simulink Environment**
Author's name:	**Yan Shchankin**
Type of thesis:	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Instrumentation and Control Engineering
Thesis reviewer:	Kilian Kessler, Head of Automation
Reviewer's department:	Grain Quality & Supply, Bühler GmbH, Beilngries, Germany

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**extraordinarily challenging**

Evaluation of thesis difficulty of assignment.

The content of the Thesis is extremely complex, especially due to the fact that there is only very few experts in industrial malting worldwide and almost no scientific material about it. Yan has to mainly rely on internal documents but also those are unscientific, fragmented and superficial. Yan did almost have no idea about the malting process upfront the thesis and I assume also the complexity of the Matlab & Simulink environment required him to go the extra mile in order to be able to understand how it works.

Satisfaction of assignment	**fulfilled**

Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.

The internal goal of the thesis was to validate if the model can be understood internally, since all involved people left the company. Besides this, the question was if the model could be used in order to learn about how to optimize a recipe in order to save electrical and thermal energy. The thesis proofs that both is possible and even gives an idea about how to proceed in order to optimize a recipe.

Method of conception	**outstanding**

Assess that student has chosen correct approach or solution methods.

I am not aware of the requirements in terms of methods and approach from the university. However, the approach of Yan was leading to a good result which is in my opinion proof that the right methods have been choosen.

Technical level	**B - very good.**

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

Since the thesis is about a Matlab/Simulink program the reader can barely see the efforts spent by the student in order to understand the program itself. Besides the challenge of understanding the kiln process, a deep knowledge about programming was needed in order to come to this result.

Formal and language level, scope of thesis	**B - very good.**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

The thesis is of a proper formal style. Surely, it was not easy for Yan to write all text in English and there are some formulations which could be written better. However, the thesis is nice to read and the author's ideas can be perfectly understood.

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

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.

In my opinion, Yan did a great job in getting the necessary sources. He found internal documents of customers which were eventually saved internally and we did not even know about it. Furthermore he managed to find good and relevant sources from the academic world. All used sources are in my view properly cited, also the internal ones.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

This thesis brings a clear business value due to the fact that It makes a complex model understandable for the reader and enables Bühler to make use of the simulation model in the future.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

The thesis has on the one hand been written in a proper scientific way but on the other hand also gives practical and realistic ideas about how to best use the model.

Questions:
- *What are the possibilities to optimize a kiln recipe considering the fact that time as well as energy consumption should be brought to a minimum?*
- *What does the author think about possible improvements which could be done in plant automation in order to improve the performance of a kiln?*

I evaluate handed thesis with classification grade **A - excellent.**

Date: **21.8.2019**   Signature:

Kilian Kessler
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