

I. IDENTIFICATION DATA

Thesis name:	CFD Analysis of a Particulate Flow
Author's name:	Malav Sudhirkumar Soni
Type of thesis :	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Process Engineering
Thesis reviewer:	Bohuš Kysela
Reviewer's department:	ŠKODA AUTO a. s.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
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Evaluation of thesis difficulty of assignment.

Numerical simulations of particulate systems are under the intensive development the last few years. Nowadays a simulation of huge amount of individual particles is enabled by the computing power increase and implementation of massive computing parallelization including GPU. In that view, all similar multi-physical tasks (as flow - particulate system - heat transfer) are very useful for future multi-physical simulation development and application in the usual practice.

Satisfaction of assignment	fulfilled
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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.

All main goals of the thesis were successfully solved and the results were also clearly summarized in conclusion.

Method of conception	correct
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Assess that student has chosen correct approach or solution methods.

The conception looks very well. The first stage was determination of basic physical properties of solids in particulate system. The next was determination of simulation conditions. The third part were simulations in simplified rotary kiln geometry using predetermined conditions. The last part was comparison with several empirical correlations.

Technical level	B - very good.
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Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

The DEM simulations are very tricky and contained many setups of material properties and system constants. It is very admirable that thesis author successfully pass through DEM simulations in relatively short time. Moreover, the mentioned simulations were connected with solution of flow and heat transfer too.

Nevertheless, mentioned multi-physical calculations are not well described as well as the used drag model in coupling between flow and DEM etc. Similarly, weak description is in the experiment section of the coefficient of restitution. There are some tables of experimental values, but how it was acquired? Was time measured in milliseconds? What was experimental system accuracy? It looks very strange.

Generally, the description in the thesis is imbalance, and the presented numbers have often inadequate decimal range in comparison with accuracy or uncertainty.

In my opinion, the simple graphical explanation should be sometimes better than long texts e.g. section of particle-particle interaction.

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 well readable. There are only some formal mistakes e.g. the figure 12 and 13 in the page 32 are probably exchanged, the labeling in some figures is hardly readable, some numbers in conclusion are not correctly written out etc.

Selection of sources, citation correctness

B - very good.

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.

The literature was cited correctly. May be more works of company DEMSOLUTIONS who developed DEM for ANSYS Fluent, or CFDDEM web pages should be cited.

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.

Please insert your commentary (voluntary evaluation).

**III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION
SUGGESTION**

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

From the general point of view, the work meet the requirements of the master thesis assignment and with respect to above mentioned comments I suggest this work to defense.

I evaluate handed thesis with classification grade **B - very good.**

Questions for the defense:

- 1. How the kiln rotation in simulation was modeled?**
- 2. Which variables affect the time step of simulation in DEM? (e. g. particle size, domain size, particle velocity etc.)**

Date: **24.08.19**

Signature: Bohuš Kysela

