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Opponent's review of master thesis

Bc. Noémi Beley: Geometry of Tube Radiant Heaters

The student was trying to compare various real constructions of tube radiant heaters which are used for heating of large spaces. The thesis was mainly aimed on radiant heat transfer and especially on the influence of one very important part of the device – the reflector – on radiant heat distribution to the space. Computational approach, specifically ANSYS Fluent with its DO radiation model was chosen for the comparison of different heaters. First, many initial tests were performed to analyze behavior of the model and to be able to find optimal settings for the final testing. At the end by defining two conditions (minimum left/right asymmetry and maximum heat transfer rate to given area) the best geometry was specified.

Positive points

The whole thesis shows a large amount of theoretical knowledge and ability to use it for solving practical problems. The given objective was systematically separated into smaller goals which were then gradually fulfilled. At the end the final conclusion was stated and also discussed. Positive is also the fact that all the disturbances were discussed in detail even though sometimes no reasonable answer was found. Correct definition of a problem is sometimes better than wrong conclusions. Moreover the thesis showed some very important results for praxis. The first for example is the fact that some heaters on the market provide very asymmetrical results and hence designers should take care also on the orientation of the device in space. The other shows that the reflector shape has significant influence on the heat distribution and therefore has to be definitely considered as a crucial aspect of heater's quality.

Negative points

- 1) The most crucial deficiency I consider the absence of critical review of related work. Many of the problems student was solving were probably already solved before.
- 2) When the student found the problem with energy – radiation coupling, it is a pity that all the initial tests were not repeated with coupled approach.
- 3) Graphical presentation of the results could have been sometimes done better. In many graphs similar colors were used, and sometimes bad scale range was printed (especially Fluent results – different colors but the same number).
- 4) Maybe it is just bad presentation, but from p. 31 one can wrongly get feeling that in general centralized heating is always less effective than decentralized which is not true.

Questions:

You have gained some experience with DO radiation model in ANSYS Fluent. Could you propose a methodology how to proceed when someone is standing at starting point in using the DO model?

To conclude, student was able to independently solve the given problem by application of learnt knowledge and under very high standard. Chosen methodology was well described and quite logical. Most of the deficiencies in the thesis were maybe caused either by lack of time or lack of enthusiasm at the final stage of the work where it is visible at most.

I may propose the overall evaluation grade to

B (very good).

In Prague 31.1.2016

Ing. Ondřej Hojer, Ph.D.

