

Appreciation
of the Thesis for Scientific Degree of Doctor of Philosophy

HYDRONIC NETWORKS: CONCEPTS AND CONTROL

By Ing. Jiří Dostál

The reviewed thesis contains 186 pages. In addition to the full texts of **Jiří Dostál**, supplementary information on hydronic components and two-pipe system stability proofs are presented in Annexes.

Jiří's Dostál dissertation touches a topical issue of hydronic network control for modern energy-efficient constructions, including nZEB. The majority of studies focuses on improvement of external building envelope, installation of renewable energy sources, while such sensitive topics as heat flow control and hydraulic balance are not widely addressed by the scientific community. Heat flow control and hydraulic balance play an important role in achieving maximal energy performance and thermal comfort. Methods for modern heating systems should be introduced. **The subject of the thesis is fully relevant to the current needs of the industry and the scientific community.**

In order to develop a new concept and control for hydronic distribution networks, the author has established four main tasks:

1. Study of the hydronic heating in buildings.
2. Definition of an enhancing concept by applying control theory to the building thermal control domain.
3. Development of the necessary simulation tools for all involved control and estimation layers.
4. Development and validation of the control and estimation algorithms involved in the concept.

However, the main objective of the thesis is not clearly defined. To improve the reader's comprehension, the author is encouraged to provide a short and clear formulation of the main objective of the thesis. However, this is a minor shortcoming which does not have any negative impact on the overall quality of the presented work. It should also be mentioned that the overall research methodology is not presented, which is also the point to be improved.

The work done in each separate chapter is sufficient and enables the attainment of all initial objectives.

The main results of this work are well structured and provide clear explanation of the achieved results and their application. The lack of examples of the possible application of the achieved results in practice is a minor shortcoming. The methods used in the thesis are appropriate, however, they are not clearly presented and explained. It is recommended to prepare a flow chart visualizing the methods and interactions between chapters for the defence procedure.

The main result Matlab toolbox “Hydronic heating toolbox” is a valuable contribution for application of the results for further research work. The toolbox has been widely tested under different boundary conditions.

The thesis satisfies the conditions of a creative scientific work. It provides a sufficient contribution to the research topic.

The author has performed a valuable analysis of large amounts of data and has developed a simulation tool. However, the author was not able to present results adequately in the conclusions. It is recommended to present the conclusions based on the research outcomes during the final presentation.

CONCLUSIONS: The author of the thesis proved to have an ability to perform research and to achieve scientific results. I do recommend the thesis for the presentation with the aim of receiving a Ph.D. degree.

Prof. Dr.sc.ing. Anatolijs Borodinecs
Department of Heat and Gas technology
Institute of Heat, Gas and Water technology
Riga Technical University