# *Nordic steps for better IAQ and energy use*

Due to the hard climate and high awareness of environmental issues in the Nordic countries a lot of attention and resources have been paid to the indoor environment and efficient use of energy. The Nordic region is warming at twice the global average. This issue presents current trends of HVAC technology and research in Denmark, Estonia, Finland, Norway and Sweden.

The role of the national HVAC associations, members of REHVA, has been significant in the development process towards high quality buildings. During the last years the design principles for ventilation have got a lot of attention due to both Covid -19 pandemic and climate change. The Nordic Ventilation Group (NVG) has actively developed new criteria for ventilation, especially ventilation design methods for airborne transmission. The new REHVA guidelines are based much on this Nordic work, which is now being adapted also to the CEN standards. Design principles of ventilation are discussed and compared continuously also on an international level (p. 5). Even in the Nordic countries with similar cultural background, the comparison of national ventilation regulations shows significant differences (p. 8). Need for harmonization is evident.

Low hanging fruits in energy saving have been picked during the last decades, but effective small steps can still be taken. The study on ventilated window systems (p. 12) underscores the practical trade-offs in ventilated window design and provides valuable guidance for balancing energy performance and indoor comfort in low-energy buildings. And the study on run-around coil heat recovery systems (p. 17), often used in combination with demand-controlled ventilation, presents a more robust control method.

Experimental work on the laboratory scale is needed to confirm the performance of energy saving measures. Monitoring in the ZEB laboratory in Trondheim, Norway highlights some of the positive lessons learned so far on the effects of various technologies on real applications (p. 20).

Opportunities to reduce energy use in the buildings can be identified by analysing a large dataset. A new benchmarking tool developed in Denmark can be used to help identify energy-saving potential in multi-family residential buildings. The developed tool provides practical insights for improving energy efficiency and planning renovation strategies (p. 24).

And in the Intelligent Human-Buildings Interaction Lab in Sweden they have successfully gathered data on occupants' perceptions and behaviour under specific energy saving measures (p. 27).

During this century attention has been changing from building level energy efficiency to the performance of the whole energy system including energy supply systems. For safety and economic reasons multiple sources of energy are used more and more in the building area.

Nowadays, various hybrid heating systems e.g. the combination of heat pumps and district heating are getting more common in energy communities. The cost-effective control strategy balancing demand and supply with continuously changing electricity prices is becoming increasingly important (p. 37). Even the use of return water of the district heating becomes an attractive heat source with current technology and pricing (p. 42). But hybrid energy systems that combine heat pumps and other heat sources are usually complex and may operate inefficiently. Effective risk management is key to ensuring reliability and good energy performance (p. 46). Hourly heat meter data, available in district heating systems, offer a tool to optimize operations, lower costs, manage assets, and forecast demand. An analysis of smart heat meter (SHM) data may also be used to pinpoint poor performing installations, helping building owners to improve their systems (p. 32).

We are grateful that REHVA offers a forum for exchange of latest information and development and hope that the articles in this issue will increase the interest of readers of REHVA Journal in cooperation with Nordic institutions and experts. ■

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